

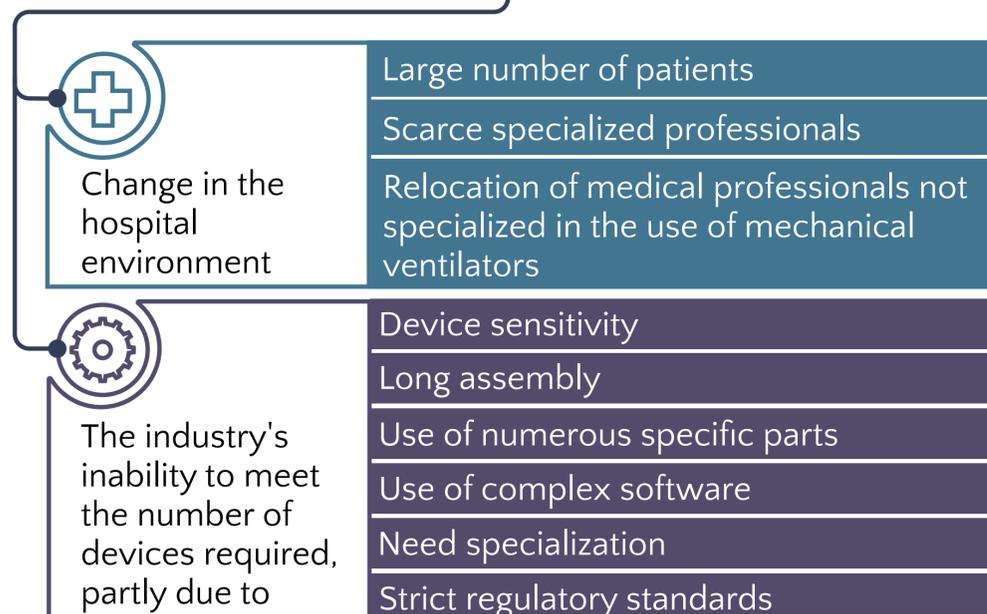
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Condensed Abstract

Among the various changes generated by the COVID-19 pandemic, there was an increase in the demand for ICU mechanical ventilators, essential to meet the most serious manifestations of the disease. This emergency context showed ergonomic flaws that already exist in this equipment, since hospitals have become a scenario of greater stress and with relocation of medical professionals with no experience in handling respirators to supply the shortage of specialized professionals. At the same time, the volume of equipment needed could not be met by the industry due to several problems, including manufacturing and design.

Background

The high need for mechanical ventilators was one of several transformations generated by the pandemic. With this device in focus, there are two contexts.



Analytical Method

Nine articles that studied the interface of state-of-the-art ICU mechanical ventilators, developed between 2005 and 2020, were analyzed. As an example, Table 1 highlights the notes of four authors whose works were better suited to the purpose of this study.

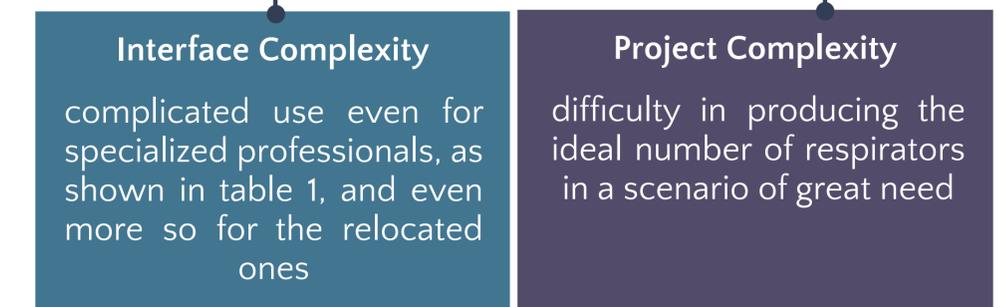
Study	Human Factor Problems Identified
1	Variation of terminology between the devices analysed
	Variation of layouts between the devices analysed
2	Difficulty turning on the device
	Difficulty in recognizing the mode and parameters
	Difficulty in configuring the pressure support
	Difficulty finding and activating the NIV mode
3	Difficulty in accessing some functions and information
	Excess of information on the main screen
	"Alarms" screen very similar to "adjustments" screen
	Fast screen change
	Small numbers
	Lack of sensitivity on the screen
4	Slow feed-back in some functions
	Difficulty reading the configurations
	Difficulty turning on the device
	Difficulty activating the NIV mode
	Lack of sensitivity on the screen

Table 1: Ergonomic flaws highlighted by the four main authors.

All nine articles analysed reported the presence of ergonomic problems in the product interface, even when used by specialized professionals.

Conclusion

The COVID-19 pandemic highlighted problems that already existed in the ICU mechanical ventilator project.



This context may have formed a new project perspective that values the improvement of manufacturing and interaction. For this, there are two areas that are indispensable.



These disciplines can benefit both critical scenarios and the hospital's daily life.

¹ Uzawa, Y., Yamada, Y., Suzukawa, M.: Evaluation of the user interface simplicity in the modern generation of mechanical ventilators. *Respir. Care* 53(3), 329-337 (2008). https://scholar.google.com/scholar_url?url=http://rc.rcjournal.com/content/respcare/53/3/329.full.pdf&hl=pt-BR&sa=T&oi=ucasa&ct=ufr&ei=OMUZYNryOY0By9YP0reLOAU&scisig=AAGBfm0jKrb6f-ulozROPQ3ZvhAaxF3kA

² Vignaux, L., Tassaux, D., Jolliet, P.: Evaluation of the user-friendliness of seven new generation intensive care ventilators. *Intensive Care Med.* 35(10), 1687-1691 (2009). <https://doi.org/10.1007/s00134-009-1580-7>

³ Maia, N.P.S.: A new method based on heuristic evaluation and realistic simulation for the development of mechanical ventilators centered on the user interface (PÓS-GRADUAÇÃO STRICTO SENSU EM CIÊNCIAS MÉDICAS, FAMED - DMC - UFC) (2014). https://www.repositorio.ufc.br/bitstream/riufc/10985/1/2014_dis_npsmaia.pdf

⁴ Marjanovic, N.S., Simone, A.D., Jegou, G., L'Her, E.: A new global and comprehensive model for ICU ventilator performances evaluation. *Ann. Intensive Care* 7(68), 1-13 (2017). <https://annalsofintensivecare.springeropen.com/track/pdf/10.1186/s13613-017-0285-2.pdf>